AEROLOGICAL OBSERVATIONS

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Free-air temperatures were mostly above normal for October. (See Table 1.) Negative departures occurred, however, at practically all levels at Ellendale and above the 2,000-meter level at Royal Center.

Relative humidity departures were small and in general of opposite sign to those for temperature.

Vapor pressure departures were mostly positive, as might be expected from the supernormal monthly temperatures.

Free-air resultant winds for the month showed an excess of southerly component at those stations having positive temperature departures, and vice versa. (See Table 2.)

It is interesting to note the unusually large diurnal rise in surface temperature at Ellendale on the 10th. From a morning minimum of 2° C. (36° F.) the surface temperature rose to 28° C. (82° F.) by 4 p. m. A kite flight which was started at 9:30 a. m. shows a rise in temperature from 12° C. (54° F.) at the surface, to 23° C. (73° F.) at 500 meters above. It is often possible to form a fairly accurate estimate of the maximum surface temperature from the temperature lapse rate occurring in the morning by assuming a fairly high lapse rate between the surface and the top of the inversion level. Thus the temperature at 500 meters in the present case was 23° C., and now, if we assume the adiabatic lapse rate for dry air between this altitude and the surface by mid-afternoon (which is quite likely), we obtain a surface temperature of 28° C., or, as happened in the present case, the actual maximum at the surface that day.

Unusually dry air aloft was revealed by the Due West kite record of the 19th. Relative humidities between 8 and 20 per cent were recorded from 1,500 to 4,300 meters, the maximum height reached. This extreme dryness was associated with a high pressure area moving in from the west. That this dryness was of wide extent was shown by the following morning map, which indicated clear weather at practically every station east of the Mississippi and south of the Great Lakes.

TABLE 1.—*Free-air temperatures, relative humidities, and vapor pressures during October, 1928*

TEMPERATURE (°C.)

Altitude m. s. l.	Broken Arrow, Okla. (233 meters) Mean	Departure from normal	Due West, S. C. (217 meters) Mean	Departure from normal	Ellendale, N. Dak. (444 meters) Mean	Departure from normal	Groesbeck, Tex. (141 meters) Mean	Departure from normal	Royal Center, Ind. (225 meters) Mean	Departure from normal	[1] Washington, D. C. (7 meters) Mean	Departure from normal
Meters												
Surface	18.0	+1.1	16.6	0.0	7.3	+0.1	20.2	+1.2	13.5	+0.4	17.9	+2.9
250	18.0	+1.2	16.4	+0.1	------	------	19.9	+1.1	13.4	+0.4	15.8	+2.0
500	17.6	+1.8	15.1	+0.4	7.1	−0.2	19.3	+1.4	12.6	+0.8	14.5	+1.6
750	16.9	+2.1	14.2	+0.7	6.7	−0.6	18.1	+1.3	11.4	+0.9	13.5	+1.8
1,000	15.8	+2.0	13.2	+0.8	5.9	−0.7	16.9	+1.2	9.9	+0.6	12.4	+2.0
1,250	14.7	+1.9	12.3	+1.0	5.3	−0.5	16.1	+1.3	8.7	+0.6	11.3	+2.1
1,500	13.6	+1.8	11.5	+1.2	4.5	−0.5	15.0	+1.3	7.4	+0.6	10.2	+2.2
2,000	11.3	+1.7	9.9	+1.4	2.0	−0.8	13.1	+1.6	4.3	0.0	7.8	+2.0
2,500	8.4	+1.4	7.4	+0.9	−0.7	−1.0	10.7	+1.5	1.9	−0.1	5.5	+1.6
3,000	5.8	+1.6	4.8	+0.6	−3.6	−1.1	8.3	+1.4	−0.7	−0.2	3.8	+1.8
3,500	3.7	+2.2	2.1	+0.6	−6.4	−1.1	4.9	+0.4	−3.4	−0.4	1.8	+2.1
4,000	0.7	+2.0	−1.1	+0.3	−8.6	−0.6	2.5	+0.6	−6.6	−0.9	------	------
4,500	------	------	−4.4	−0.2	−9.8	+1.0	1.5	+2.3	−9.6	−1.0	------	------
5,000	------	------	------	------	------	------	1.5	+4.3	−11.6	−0.6	------	------

RELATIVE HUMIDITY (%)

Surface	69	+2	73	+9	62	−6	80	+6	72	+3	72	0
250	68	+1	73	+9	------	------	79	+7	72	+3	73	+4
500	61	−2	73	+10	61	−5	75	+6	68	+2	70	+4
750	56	−5	70	+8	56	−5	72	+4	67	+2	68	+2
1,000	55	−4	68	+7	54	−5	68	+2	66	+3	65	−1
1,250	54	−3	64	+4	52	−5	63	0	65	+4	65	−2
1,500	53	−2	59	+2	50	−4	61	0	66	+8	62	−4
2,000	48	−2	52	+2	48	−3	53	−2	69	+15	60	−3
2,500	44	−2	48	+3	45	−4	43	−6	58	+9	56	−1
3,000	40	−3	45	+2	47	0	41	−2	54	+8	39	−9
3,500	41	−1	41	0	44	−3	48	+7	55	+10	27	−17
4,000	25	−11	42	+1	47	+1	31	−9	54	+11	------	------
4,500	------	------	47	+5	43	−2	17	−23	56	+13	------	------
5,000	------	------	------	------	------	------	8	−29	46	+12	------	------

VAPOR PRESSURE (mb.)

Surface	14.73	+1.56	14.66	+1.91	6.23	−0.72	19.49	+2.68	11.58	+0.91	15.58	+2.70
250	14.60	+1.53	14.49	+1.93	------	------	18.95	+2.79	11.54	+0.98	14.03	+2.43
500	12.93	+1.21	13.41	+2.11	6.02	−0.81	17.20	+2.62	10.42	+1.06	12.40	+1.92
750	11.35	+0.75	12.20	+1.87	5.19	−1.11	15.28	+1.89	9.57	+1.16	11.34	+1.62
1,000	10.28	+0.59	11.07	+1.54	4.68	−1.08	13.33	+1.22	8.64	+1.07	10.09	+1.15
1,250	9.42	+0.63	9.76	+1.17	4.33	−0.89	11.78	+0.99	7.64	+0.90	9.35	+1.09
1,500	8.52	+0.59	8.34	+0.85	4.03	−0.68	10.71	+1.06	6.92	+0.98	8.11	+0.71
2,000	6.45	+0.36	6.36	+0.70	3.41	−0.48	8.29	+0.98	5.66	+0.99	6.71	+0.75
2,500	4.80	+0.15	4.95	+0.54	2.76	−0.43	5.99	+0.46	3.93	+0.35	5.46	+0.74
3,000	3.69	+0.13	3.96	+0.40	2.33	−0.25	4.95	+0.81	2.91	+0.06	3.01	−0.24
3,500	3.07	+0.29	3.43	+0.50	1.91	−0.21	4.68	+1.37	2.40	+0.03	1.51	−0.78
4,000	1.73	−0.19	2.92	+0.37	1.72	+0.02	2.62	−0.05	1.64	−0.11	------	------
4,500	------	------	2.42	+0.17	1.54	+0.21	1.38	−0.86	1.18	−0.09	------	------
5,000	------	------	------	------	------	------	0.78	−1.12	0.46	−0.22	------	------

[1] Naval air station.

TABLE 2.—*Free-air resultant winds (m. p. s.) during October, 1928*

Altitude m. s. l.	Broken Arrow, Okla. (233 meters) Mean Direction	Mean Velocity	Normal Direction	Normal Velocity	Due West, S. C. (217 meters) Mean Direction	Mean Velocity	Normal Direction	Normal Velocity	Ellendale, N. Dak. (444 meters) Mean Direction	Mean Velocity	Normal Direction	Normal Velocity	Groesbeck, Tex. (141 meters) Mean Direction	Mean Velocity	Normal Direction	Normal Velocity	Royal Center, Ind. (225 meters) Mean Direction	Mean Velocity	Normal Direction	Normal Velocity	Washington, D. C. (34 meters) Mean Direction	Mean Velocity	Normal Direction	Normal Velocity
Meters	°		°		°		°		°		°		°		°		°		°		°		°	
Surface	S.	2.8	S. 2 W.	2.3	N. 85 E.	1.4	N. 47 E.	1.6	N. 55 W.	2.1	N. 68 W.	1.9	S. 2 E.	2.3	S. 45 E.	0.8	S. 55 W.	2.4	S. 51 W.	2.2	S. 84 W.	0.3	N. 53 W.	0.9
250	S. 4 E.	2.8	S. 2 W.	2.4	N. 84 E.	1.5	N. 45 E.	1.7	------	------	------	------	S. 1 E.	3.7	S. 31 E.	1.5	S. 52 W.	2.8	S. 50 W.	2.5	S. 82 W.	1.8	N. 53 W.	2.1
500	S. 7 W.	4.0	S. 10 W.	3.6	S. 73 E.	2.2	N. 51 E.	2.1	N. 63 W.	2.2	N. 78 W.	2.0	S. 15 W.	5.5	S. 15 E.	2.7	S. 52 W.	5.2	S. 57 W.	4.8	S. 82 W.	3.4	N. 62 W.	2.9
750	S. 14 W.	4.5	S. 18 W.	4.3	S. 60 E.	2.0	N. 57 E.	1.7	N. 64 W.	3.5	N. 84 W.	2.9	S. 14 W.	5.9	S. 7 E.	3.1	S. 59 W.	6.5	S. 65 W.	6.0	N. 64 W.	4.6	N. 65 W.	3.9
1,000	S. 23 W.	4.7	S. 26 W.	4.3	S. 39 E.	1.0	N. 39 E.	0.8	N. 69 W.	4.3	N. 84 W.	3.7	S. 22 W.	6.0	S. 4 W.	3.1	S. 63 W.	7.2	S. 71 W.	6.6	N. 67 W.	4.7	N. 61 W.	4.8
1,250	S. 31 W.	4.5	S. 38 W.	4.6	S. 9 E.	1.1	N. 45 W.	0.6	N. 72 W.	5.5	N. 81 W.	4.5	S. 21 W.	5.8	S. 13 W.	3.2	S. 68 W.	8.2	S. 75 W.	7.4	------	------	------	------
1,500	S. 38 W.	4.4	S. 46 W.	4.7	S. 21 W.	1.1	N. 78 W.	1.4	N. 77 W.	6.7	N. 81 W.	5.4	S. 27 W.	5.6	S. 24 W.	3.2	S. 68 W.	9.4	S. 79 W.	8.1	N. 69 W.	6.4	N. 60 W.	6.3
2,000	S. 47 W.	4.6	S. 56 W.	5.1	S. 75 W.	4.0	N. 83 W.	2.5	N. 75 W.	8.0	N. 80 W.	6.9	S. 38 W.	5.3	S. 40 W.	3.3	S. 71 W.	10.1	S. 82 W.	9.3	N. 79 W.	7.4	N. 65 W.	6.9
2,500	S. 54 W.	4.0	S. 69 W.	5.5	S. 71 W.	6.5	N. 85 W.	4.5	N. 83 W.	7.5	N. 77 W.	8.3	S. 49 W.	4.9	S. 48 W.	3.6	S. 74 W.	10.9	S. 87 W.	10.2	N. 72 W.	7.7	N. 66 W.	7.8
3,000	S. 59 W.	3.8	S. 67 W.	6.4	S. 78 W.	8.8	N. 86 W.	5.5	N. 83 W.	8.9	N. 79 W.	9.5	S. 62 W.	4.9	S. 58 W.	3.9	S. 76 W.	10.8	S. 88 W.	11.0	N. 71 W.	9.0	N. 70 W.	8.3
3,500	S. 87 W.	3.9	S. 74 W.	7.4	S. 77 W.	10.3	S. 87 W.	6.6	N. 72 W.	8.1	N. 81 W.	11.0	S. 84 W.	5.6	S. 60 W.	4.1	S. 81 W.	12.1	N. 89 W.	12.6	N. 71 W.	10.4	N. 72 W.	9.3
4,000	N. 68 W.	2.7	S. 69 W.	8.1	S. 67 W.	9.6	S. 78 W.	6.3	S. 69 W.	13.0	N. 86 W.	12.0	N. 68 W.	12.1	S. 52 W.	4.1	S. 77 W.	11.8	S. 89 W.	13.9	N. 73 W.	11.9	N. 76 W.	9.9
4,500	------	------	------	------	S. 88 W.	12.2	N. 86 W.	6.3	N. 68 W.	16.0	S. 85 W.	13.5	------	------	------	------	S. 68 W.	13.2	S. 80 W.	16.1	N. 86 W.	13.0	N. 81 W.	9.6
5,000	------	------	------	------	N. 68 W.	12.0	N. 44 W.	7.6	N. 68 W.	16.0	N. 85 W.	14.7	------	------	------	------	N. 83 W.	11.4	N. 87 W.	16.0	N. 88 W.	15.3	N. 78 W.	10.2